Improving Fuel Economy of Sport-Utility Vehicles (SUVs) Through Diesel Technology and Vehicle Improvements

Analysis performed for Dept. of Commerce and Dept. of Energy

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Baseline SUV

- Averaged 3 domestic SUVs
  - Ford Explorer, Jeep Grand Cherokee, Chevy Blazer
  - Baseline FE (EPA adjusted): 15.3 mpg city, 20 mpg hwy, 17.2 mpg combined
  - Unadjusted FE: 17 mpg city, 25.6 mpg hwy, 20 mpg combined
  - Weight: 3997 lbs
  - C_D = 0.53 (from Durango), Frontal Area = 2.2 m^2
  - Baseline engine: 193 hp = 144 kW

Methodology

- Created average SUV with SI engine that matched actual vehicles in market
- Replaced SI engine with equivalent performance CIDI engine
- Made step-wise improvements in
  - mass
  - aerodynamics
  - accessory loads
  - tire rolling resistance
  - chassis losses (brake, bearing, and seal losses)
- *Maintained performance parity for each vehicle*
  - 0-60 mph in 9.5 s, 0-85 mph in 19.4 s, 40-60 in 4.3 s

Fuel Economy Results

Vehicle Configuration	*Engine (kW)*	*City mpg*	*Hwy mpg*	***Comb. mpg***	***X***
Baseline loads, AT, SI engine	144.0	17.8	23.5	**20.0**	**1.00**
Baseline loads, AT, CIDI engine	128.4	21.9	31.7	**25.0**	**1.25**
Same as previous with 20% lower mass	107.2	25.2	34.5	**28.7**	**1.43**
Same as previous with 25% lower aero.	104.6	26.3	39.0	**30.9**	**1.54**
Same as previous with 10% lower access.	104.6	26.5	39.2	**31.0**	**1.55**
Same as previous with 10% lower rolling	103.9	26.8	40.0	**31.5**	**1.58**
Same as previous with 25% lower brake/bearing	103.9	27.0	40.4	**31.7**	**1.59**

Maintained performance parity for each vehicle:

0-60 mph in 9.5 s, 0-85 mph in 19.4 s, 40-60 in 4.3 s